Computer Models
For
Fire and Smoke

Model Name:	Multi Room Fire Code (MRFC)
Version:	2.7.3
Classification:	multi-room-zone-model
Very Short Description:	Simulation model for calculation of smoke movement and temperature load on structures
Modeler(s), Organization(s):	Arbeitsgemeinschaft Brandsicherheit (AGB) Au in den Buchen 90 76646 Bruchsal Tel: +49/7257/902201, Fax: +49/7257/902202 email: info@Brandschutz-agb.de
User's Guide:	Referenzhandbuch für MRFC (Multi Room Fire Code), Version 2.7, Bruchsal/Wien, December 2000.
Technical References:	Referenzhandbuch für MRFC (Multi Room Fire Code), Version 2.7, Bruchsal/Wien, December 2000. U. Max: Zur Berechnung der Ausbreitung von Feuer und Rauch in komplexen Gebäuden, Dissertation, Gesamthochschule Kassel, 1990.
Validation References:	U. Schneider; Ch. Lebeda; U. Max:An evaluation and Applicability Study for Use of different Fire Codes in NPP Fire Design, Post Smirt Conference No. 6, Lyon, France, 25-29 August 1997. Referenzhandbuch für MRFC (Multi Room Fire Code), Version 2.7, Bruchsal/Wien, December 2000.
Availability:	Members of VIB (Verein zur Förderung von Ingenieurmethoden im Brandschutz)
Price:	10000 DM once, 2500 DM per year

Necessary Hardware:	Intel architecture, WINDOWS 95, 98, 2000 WINDOWS NT, RISC-processor with UNIX (not for shells), 32 MB RAM, spread sheet programme for grafics
Computer Language:	FORTRAN/C
Size:	500 MB maximum (50 MB for programme, databases, documentation)
Contact Information:	Verein zur Förderung von Ingenieurmethoden im Brandschutz (VIB) c/o Prof. DDr. Ing. U. Schneider Institut für Baustofflehre, Bauphysik und Brandschutz TU Wien Karlsplatz 13/206 A-1040 Wien or modeler organisation as above

Detailed Description:

MRFC is the model to calculate the physical data during a fire such as temperature distribution in gases and structures and smoke transport inside a complex building and between the building and outside. It is the kernel of the zone fire model that is supported by AGB. Included in the package are data editors and reporting tools for the model MRFC. For additional details on the programme and the availability, please visit the web site http://www.vib-mrfc.de/ (in German language).

MRFC is a zone model and is used to calculate the evolving distribution of smoke, fire gases and heat throughout a constructed facility during a fire. In MRFC, each compartment consists of one layer (fully developed fires) or is divided into two layers, and many zones for detailed interactions. The size of the fire is variable during simulation. The modeling equations used in MRFC take the mathematical form of an initial value problem for a system of ordinary differential equations (ODE). These equations are derived using the conservation of mass, the conservation of energy, the ideal gas law and relations for density and internal energy. These equations predict as functions of time quantities such as pressure, layer heights and temperatures given the accumulation of mass and enthalpy in the two layers. The MRFC model then solves of a set of equations to compute the environment in each compartment and a collection of algorithms to compute the mass and enthalpy source terms. The model incorporates the evolution of the species, such as carbon monoxide, which are important to the safety of individuals subjected to a fire environment.

Version 2.7.3 models up to 40 compartments, 100 openings, fan or duct systems, several individual fires, up to one flame-spread object, multiple plumes, ceiling jets, multiple sprinklers, and the seven species considered most important in toxicity of fires. The geometry includes variable area/height relations, thermophysical and pyrolysis databases,

multilayered walls, wind, the stack effect, building leakage, and flow through holes in floor/ceiling connections. The distribution includes text report generators, even for graphics with common plotting packages and a system for comparing many runs done for parameters estimation.